

A Novel Method of Measuring Saturated Vapor Pressures of Subliming Solids

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An extraordinary new method has been developed to measure the saturated vapor pressures of subliming solids. This method uses a differential flow meter, previously used on a high precision viscometer that is capable of measuring extremely small changes in flow of a gas stream.

The differential flow meter is a variation of a conventional laminar flow or capillary flow meter. A carrier flow of nitrogen is split into two equal flows, which are each then passed through two matched but not identical capillary tubes. The pressure difference between the two flows is monitored at the upstream end of the capillaries, in order to measure the difference in flow between the two streams. The meter is calibrated by adding known flows of nitrogen to one side, and recording the pressure difference between the two streams.

The vapor pressure measurements are made by introducing a sample of the subliming solid to one stream, and then the increase in flow of the stream due to evaporation of the solid is measured. The apparatus is run under partial vacuum, so that the vapor can be assumed to behave ideally and the change in flow can be converted into a vapor pressure. When the sample of the solid is removed from the measurement stream, the flow is turned back down to the original carrier flow. This removal step can be used as a check on the addition measurement. The method is quick: it takes about 45 minutes for each data point.

A simple apparatus has been constructed to test the method, and preliminary results are presented for measurements made for camphor and naphthalene in the temperature range from 290 to 340 K.